Remarks

Claims 1-154 are pending in the above captioned application. Claims 1-54 stand rejected.

Claims 1-77 have been rejected on obvious double patenting ground, the Examiner having not received the terminal disclaimer for USSN 10/012,002 now issued on September 23, 2003 as U.S. Patent No. 6,625,191. Applicants have in any event re-submitted with this Response the terminal disclaimer for U.S. Patent No. 6,625,191 along with the required fee. The Examiner's rejection of claims 1-77 for obviousness double patenting is, therefore, rendered improper and the Examiner is respectfully requested to withdraw the rejection of claims 1-77 and allow claims 1-77, as the Examiner has indicated they would be allowable with the submission of the appropriate missing terminal disclaimer.

Claims 78-154 stand rejected under 35 U.S.C. §112, first paragraph. The Examiner has taken the position that:

> The claim(s) contains subject matter which is not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The claims 78 contains news subject matter of "4000 gas discharges per second" which is not supported by the original specification. The specification recites only the 4000 Hz (Abstract) or 4000 pulses per second (paragraph 0015), which is not the same as 4000 gas discharges per second. Further, 4000 gas discharges per second is not a proper measure unit for a gas laser. Claims 79-154 depend from rejected claim 78 and render these dependent claims indefinite.

Applicants respectfully traverse the indefiniteness rejection. The specification is replete with references to the fact that the gas discharge laser is one in which the output pulse repetition rate, stated to be in Hz, i.e., cycles or repetitions per second, is the same as the pulse repetition rate stated as 4000 pulses per second, and results from gas discharges between the electrodes in the laser chamber occurring at the rate of 4000 gas discharges per second or 4000Hz, i.e., one gas discharge, per chamber, per output laser pulse, from the laser. Therefore, 4000 gas discharges per second between the electrodes

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in each chamber results in 4000 laser output light pulses per second from the laser. Further, it is clear that gas discharges resulting from applying an electrical pulse to the electrodes (at a certain electrical pulse application rate, e.g., 4000 pulses per second or 4000Hz) is a proper terminology to be used in regard to a gas discharge laser, e.g., an ArF, or KrF or molecular fluorine gas discharge laser.

Even if the Specification was unclear on this point, which it is not, the prior art is also replete with references to the fact that gas discharge lasers of the type described in the above captioned application, e.g., molecular fluorine gas discharge lasers and ArF or KrF gas discharge lasers, operate as just described and the gas discharge rate in the chamber (or in each chamber for a MOPA laser configuration) as described in the Specification of the above captioned application (expressed in laser output pulses per second or Hz) is identical to (1) the number of electrical pulses per second applied to the electrodes in a respective chamber, (2) the number of resulting gas discharges occurring in the respective chamber per second occurring in a gas discharge region between the electrodes, and (3) the number of resulting laser output light pulses per second coming from the laser due to the same number of occurring gas discharges.

The Abstract of the above captioned patent application itself equates laser output light pulses with gas discharges and equates Hz to laser output light pulse repetition rate. The Abstract states:

> An injection seeded modular **gas discharge laser system** capable of producing high quality **pulsed laser beams at pulse rates of about 4,000 Hz or greater** and at pulse energies of about 5 mJ or greater. **Two separate discharge chambers are provided**, one of which is a part of a **master oscillator** producing a very narrow band seed beam which is **amplified in the second discharge chamber.** ... In the preferred **MOPA** embodiment, each chamber comprises a single tangential **fan** providing sufficient gas flow to **permit operation at pulse rates of 4000 Hz or greater** by clearing debris from the discharge region **in less time than the approximately 0.25 milliseconds between pulses.** ... (Abstract)

The fan clears the gas after each gas discharge between the electrodes occurring at the rate of one every 0.25 milliseconds, i.e., at the disclosed 4KHz laser output light pulse repetition rate.

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The specification also contains a table listing:

1 Rep Rate	**Pulse** Energy	**Pulse** Duration
4 kHz	7 mJ	24 ns
4 kHz	7 mJ	40 ns
4 kHz	10 mJ	24 ns
4 kHz	12 mJ	12 ns (p. 8, lines 1-5)

This equates the 4kHz pulse repetition rate with laser output light pulses having the stated pulse energy and the stated pulse duration.

Further:

(3) Each of the two laser chambers and the **pulse power supplies** for the chambers are very similar to the chamber and **pulse power supply** utilized in a 4000 Hz single chamber ArF laser system described U.S. patent application Ser. No. 09/854,097 which has been incorporated herein by reference. (p. 10, lines 12-16)

This pulse power supply, as disclosed and as referenced in numerous prior issued patents in addition to the one referenced in the quoted portion of the Specification of the above captioned application, supplies the electrical pulsed energy to the electrodes at the same rate of 4000 electrical pulses per second (4000 Hz) that result in the gas discharges between the electrodes to which the electrical pulses are supplied at the specified electrical pulse repetition rate resulting in the same laser output pulse repetition rate due to gas discharges produced from the electrical pulses supplied at this same electrical pulse repetition rate of 4KHz.

In addition:

The short ***pulse*** (about 12 ns) output from power amplifier 12 is stretched in ***pulse*** stretching unit 13 located behind optical table 11. The entire beam path through the laser system including the ***pulse*** stretcher is enclosed in vacuum compatible enclosures (not shown) and the enclosures are purged with nitrogen or helium. (p. 10, lines 23-27)

This pulse refers to the output laser light pulse coming from the power amplifier into the disclosed pulse stretcher.

Also:

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Also, the output ***pulse*** energy is about 0.1 mJ to 1.0 mJ instead of about 5 mJ. However, major improvements over the '323 laser are provided to permit operation at 4000 Hz and greater. (p. 12, lines 9-11)

Once again the reference is to the output laser light pulses occurring at the rate of 4000 per second.

In addition:

The gas flow clears the debris of each discharge from the discharge region prior to the next **pulse**. (p. 12, lines 27-28)

This is the fan function referred to in the Abstract that must occur in less than 0.25 milliseconds at the disclosed 4KHz pulse rate, which here could be referring to either the gas discharge pulse repetition rate or the electrical pulse repetition rate. The point is that the fan clears out the discharge region, which is disclosed to be between the electrodes, faster than 4000 timers per second in order to get the discharge region ready for the "next pulse," which occurs both electrically between electrodes and as a resulting laser output light pulse due to the gas discharge caused by the electrical pulse, each at the rate of 4KHz.

Furthermore:

However, normally lithography lasers operate in a burst mode such as the following to process 20 areas on each of many wafers:

Off for 1 minute to move a wafer into place

4000 Hz for 0.2 seconds to illuminate area 1

Off for 0.3 seconds to move to area 2

4000 Hz for 0.2 seconds to illuminate area 2

... (p. 25, lines 16-21)

This again refers to the output laser light pulses at a pulse repetition rate of 4000 Hz.

In addition:

To accommodate greater heat loads water cooling of **pulse power components** is provided in addition to the normal forced air cooling provided by cooling fans inside the laser cabinet in order to support **operation pulse rates of 4 KHz or greater.** (p. 27, lines 2-5)

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This indicates that the pulse power electrical components must be water cooled to be able to deliver the high rate of electrical pulses at 4KHz or greater, which equates also, as noted above, to the gas discharge rate per second between the electrodes to which the pulse power system is delivering electrical pulses at the specified rate, and to the output laser light pulses resulting at the same 4KHz pulse repetition rate due to the respective gas discharges.

And finally:

> At a **pulse** rate of 4000 Hz, the discharge will add about 12 kw of heat energy to the laser gas. To remove the heat produced by the discharge along with the heat added by the fan four separate water cooled finned heat exchanger units 58A are provided. (p. 47, lines 22-25)

This again refers to the gas discharges occurring at the same rate as the 4000 Hz electrical pulse delivery rate and the output laser light pulse repetition rate.

There are other references in the Specification that equate 4KHz to the repetition rate of the electrical pulses delivered by the pulse power system to the electrodes, causing the self-same gas discharge repetition rate between the electrodes induced by the applied electrical pulses at the specified rate, and the laser output light pulses at the also self-same 4000 Hz output pulse repetition rate.

Similar disclosures in dozens of patents issued to Applicants' assignee Cymer Inc. contain similar references to the same operating parameters (single chamber or dual chamber).

The Examiner's supervisor has been the supervisory Examiner on other applications filed by Applicant's assignee and approved the self same language about gas discharges in similarly worded claims. See, e.g., U.S. Application Serial No.: 10/141,216, entitled LASER LITHOGRAPHY LIGHT SOURCE WITH BEAM DELIVERY, filed on May 7, 2002, Attorney Docket No. 2002-0039-01; and U.S. Application Serial No.: 10/255,806, entitled LITHOGRAPHY LASER SYSTEM WITH IN-PLACE ALIGNMENT TOOL, filed on September 25, 2002, Attorney Docket No. 2002-0085-01.

For the above stated reasons the Examiner's rejection of claims 78-154 for indefiniteness is not proper and the Examiner is respectfully requested to withdraw the rejection of claims 78-154 and allow claims 78-154.

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Conclusi ns

Applicants submit that claims 1-154 are in a condition for allowance and respectfully request the Examiner to withdraw the rejections of claims 1-154 and allow claims 1-154.

Applicants hereby authorize the Commissioner to charge Applicants' assignee's Deposit Account No. 03-4060 in the amount of $110.00 for the terminal disclaimer filed with this Response to replace the one that has not been put in the file of the above captioned application. Applicants' do not believe that there are any other charges due in regard to this Response, but in the event that there are, hereby authorize the Commissioner to charge such charges to the just referenced Deposit Account.

Respectfully submitted,

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